

## **Cruise Report**

### **U.S. Geological Survey Cruise Report 2017-686-FA**

**October 25-November 1, 2017**

**James Conrad**

**USGS**

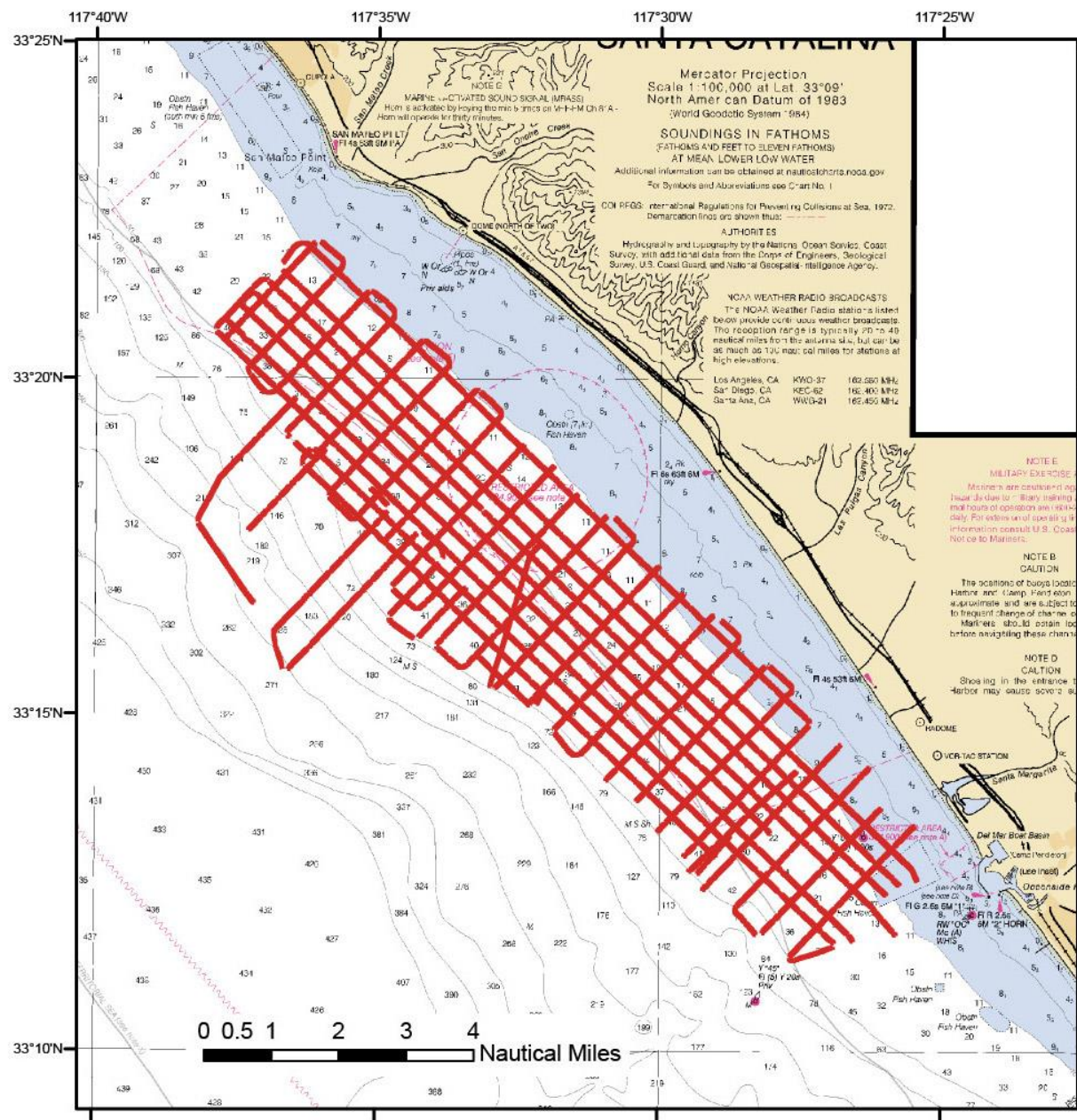
#### **Summary**

An 8-day high-resolution geophysical survey was conducted in the Gulf of Santa Catalina between San Mateo Point and Oceanside, Calif. (Fig. 1) aboard the R/V *Parke Snavely*, a 33' research vessel operated by the Pacific Coastal and Marine Science Center in Santa Cruz, Calif. The U.S. Geological Survey (USGS) is working in partnership with the Bureau of Ocean Energy Management (BOEM) and the State of California Ocean Protection Council (OPC) to evaluate sand and gravel resources in Federal and State waters for potential use in future beach nourishment projects. The work is focused on three study sites that were chosen in a collaborative exercise between project partners and members of the California Coastal Sediment Management Workgroup (CSMW). Sites were prioritized by the proximity to critical erosion hotspots as defined in Regional Coastal Sediment Management Plans prepared by county and local government agencies in coordination with CSMW.

Prior to the leasing and development of outer continental shelf (OCS) sand resources for use in beach restoration or coastal protection, BOEM requires geophysical and geotechnical studies to identify and evaluate offshore sand resources. These studies must synthesize existing data and collect new data. During this cruise, the USGS will collect continuous records of high-resolution seismic profiles with an EdgeTech 512i Chirp seismic profiler, high-resolution seafloor bathymetry and acoustic backscatter properties with a Submetrix SwathPlus interferometric sonar, seafloor magnetic properties with a Geometrics G882 cesium-vapor marine magnetometer. Additionally, seafloor sediment grab samples will be collected throughout the survey area to provide preliminary assessments of sediment grain size distributions.

The USGS research activity 2017-686-FA took place from October 25 to November 1, 2017. All operations took place during daylight hours between 07:15 AM and 5:14 PM Pacific Standard Time (PST). The Edgetech 512 Chirp sub-bottom profiling system consists of a source transducer and an array of receiving hydrophones housed in a 500-lb "fish" towed at a depth of several meters below the sea surface. The swept-frequency "chirp" source signal is between 1,000 and 7,500 Hz, and data are recorded by hydrophones located on the bottom of the fish. At boat speeds of 4 to 4.5 nm/hour, seismic traces are collected roughly every 1 to 2 meters. The data consists of three channels: a raw channel, a 90-degree phase-shifted channel, and an "amplitude envelope" channel created and transformed internally from the other two channels. The acoustic imaging system consists of a Submetric SwathPlus pole-mounted transducer operating at 238 kHz. Combined, these data will be used to characterize the surface and subsurface properties of the study area, including unconsolidated sediment thickness, subsurface sediment horizons, surface sediment properties, and the potential presence of large metallic materials on or near the seafloor bed. This information will, in turn, be used to plan the second cruise in the study site focused on the collection of surface and subsurface sediment with vibracores. The R/V *Parke Snavely* operated out of

Oceanside Harbor, tying up nightly and transiting directly to the survey sites (Figure 1). Once at the survey site, data were collected at a survey speed of 4-5 knots. Prior to operation, the U.S. Coast Guard was notified of the plan and purpose for the survey. Figure 1 shows the location of the survey track lines, with track line time and starting and ending locations listed in Table 1. Weather observations are provided in Appendix A and marine wildlife observations are provided in Appendix B.



**Figure 1.** Extent of bathymetric and seismic reflection data (red lines) collected October 25-November 1, 2017, offshore southern California between San Mateo Point and Oceanside.

**Table 1.** Survey track information.

Line Number	Date	Start Time	Start Lat.	Start Lon.	End Time	End Lat.	End Lon.
1	10/25/2017	9:26 AM	33.220920	-117.467047	10:22 AM	33.268437	-117.526696
2	10/25/2017	10:23 AM	33.268623	-117.526902	12:03 PM	33.348148	-117.628713
3	10/25/2017	12:20 PM	33.342572	-117.629093	12:46 PM	33.366944	-117.602049
3T	10/25/2017	12:47 PM	33.367175	-117.600442	1:20 PM	33.336015	-117.621604
4T	10/25/2017	1:21 PM	33.334063	-117.620812	1:28 PM	33.330538	-117.613079
5	10/25/2017	1:28 PM	33.330673	-117.612971	1:54 PM	33.354836	-117.586035
5T	10/25/2017	1:55 PM	33.354898	-117.58539	2:02 PM	33.348025	-117.579173
6	10/25/2017	2:02 PM	33.347921	-117.579261	2:33 PM	33.31982	-117.610179
6T	10/25/2017	2:34 PM	33.319156	-117.609963	2:34 PM	33.318724	-117.609376
6Ta	10/25/2017	2:35 PM	33.317447	-117.607723	2:42 PM	33.315245	-117.600649
7	10/25/2017	2:42 PM	33.315348	-117.600486	3:12 PM	33.342695	-117.570171
7T	10/25/2017	3:12 PM	33.342750	-117.569886	3:19 PM	33.336150	-117.562603
8	10/25/2017	3:19 PM	33.336063	-117.562736	3:54 PM	33.304218	-117.597621
8T	10/25/2017	3:55 PM	33.304002	-117.597551	4:02 PM	33.299030	-117.588794
9	10/25/2017	4:02 PM	33.299184	-117.588668	4:36 PM	33.330439	-117.553647
9T	10/25/2017	4:36 PM	33.330072	-117.553015	4:43 PM	33.323742	-117.547329
10	10/25/2017	4:43 PM	33.323611	-117.547473	5:14 PM	33.293219	-117.580950
11	10/26/2017	8:47 AM	33.195692	-117.429908	11:54 AM	33.353988	-117.619105
12	10/26/2017	11:54 AM	33.353846	-117.618930	12:58 PM	33.301029	-117.552524
13	10/26/2017	1:18 PM	33.317043	-117.540044	1:58 PM	33.281901	-117.578867
13T	10/26/2017	1:59 PM	33.281079	-117.578655	2:06 PM	33.276799	-117.570298
14	10/26/2017	2:06 PM	33.276895	-117.570149	2:46 PM	33.311878	-117.531159
15	10/26/2017	3:07 PM	33.300463	-117.551905	3:59 PM	33.205647	-117.432809
16	10/27/2017	7:52 AM	33.194125	-117.442586	10:58 AM	33.344720	-117.630904
16T	10/27/2017	10:59 AM	33.345626	-117.631218	11:13 AM	33.357569	-117.616148
17	10/27/2017	11:13 AM	33.357231	-117.615564	12:29 PM	33.291120	-117.533099
18	10/27/2017	12:47 PM	33.305089	-117.523869	1:29 PM	33.267542	-117.565606
18T	10/27/2017	1:29 PM	33.266909	-117.565657	1:37 PM	33.262453	-117.556606
19	10/27/2017	1:37 PM	33.262556	-117.556484	2:15 PM	33.299434	-117.515542
19T	10/27/2017	2:17 PM	33.298988	-117.513155	2:22 PM	33.292974	-117.507974
20	10/27/2017	2:22 PM	33.292844	-117.508077	3:01 PM	33.256721	-117.548451
20T	10/27/2017	3:02 PM	33.256959	-117.549654	3:33 PM	33.291290	-117.533207
21	10/27/2017	3:33 PM	33.2911708	-117.533085	5:10 PM	33.208087	-117.428846
22	10/28/2017	7:46 AM	33.2091281	-117.423619	8:19 AM	33.237433	-117.458470
22T	10/28/2017	8:21 AM	33.236325	-117.459389	8:50 AM	33.211328	-117.491019
22Ta	10/28/2017	8:53 AM	33.210933	-117.488536	9:04 AM	33.219813	-117.479413
23	10/28/2017	9:09 AM	33.218367	-117.479573	11:10 AM	33.315845	-117.602173
23T	10/28/2017	11:11 AM	33.315796	-117.603076	11:14 AM	33.311937	-117.605309
24	10/28/2017	11:15 AM	33.311548	-117.604718	12:23 PM	33.255070	-117.533624
25	10/28/2017	12:31 PM	33.252858	-117.538445	1:09 PM	33.287019	-117.500043
25T	10/28/2017	1:10 PM	33.287140	-117.498940	1:17 PM	33.280352	-117.492642

26	10/28/2017	1:17 PM	33.280256	-117.492770	1:54 PM	33.246498	-117.530841
26T	10/28/2017	1:54 PM	33.245718	-117.530712	2:03 PM	33.240909	-117.522506
27	10/28/2017	2:03 PM	33.240999	-117.522413	2:42 PM	33.274912	-117.483685
27T	10/28/2017	2:44 PM	33.273695	-117.481752	2:50 PM	33.268021	-117.477166
28	10/28/2017	2:50 PM	33.267920	-117.477267	3:30 PM	33.233857	-117.515693
28T	10/28/2017	3:30 PM	33.233259	-117.516019	3:39 PM	33.228550	-117.506766
29	10/28/2017	3:40 PM	33.228709	-117.506623	4:15 PM	33.262388	-117.468634
29T	10/28/2017	4:16 PM	33.262352	-117.467416	4:23 PM	33.255626	-117.461536
30	10/28/2017	4:24 PM	33.255558	-117.461655	5:00PM	33.221214	-117.500325
31	10/29/2017	10:48 AM	33.366451	-117.603997	1:03 PM	33.248289	-117.455455
32	10/29/2017	1:03 PM	33.247737	-117.455677	1:38 PM	33.215045	-117.492560
33	10/29/2017	1:50 PM	33.206698	-117.487002	2:28 PM	33.242967	-117.446239
33T	10/29/2017	2:28 PM	33.243249	-117.445858	2:30 PM	33.243009	-117.443739
34	10/29/2017	2:36 PM	33.237354	-117.437844	3:14 PM	33.202897	-117.47677
34T	10/29/2017	3:14 PM	33.202746	-117.476909	3:22 PM	33.195806	-117.471153
35	10/29/2017	3:23 PM	33.196182	-117.469472	3:55 PM	33.227396	-117.434220
35T	10/29/2017	3:56 PM	33.227665	-117.433868	4:03 PM	33.223851	-117.424777
36	10/29/2017	4:04 PM	33.222901	-117.424400	4:39 PM	33.190484	-117.461100
36T	10/29/2017	4:40 PM	33.190004	-117.461238	4:48 PM	33.192802	-117.448454
37	10/29/2017	4:49 PM	33.193681	-117.448155	5:02 PM	33.205612	-117.463397
37a	10/30/2017	8:34 AM	33.205473	-117.463243	8:50 AM	33.219785	-117.481441
38	10/30/2017	8:59 AM	33.214945	-117.483188	9:46 AM	33.255805	-117.534610
38T	10/30/2017	9:48 AM	33.256277	-117.534168	9:51 AM	33.252695	-117.536304
39	10/30/2017	9:52 AM	33.252399	-117.538069	10:17 AM	33.276135	-117.567871
39T	10/30/2017	10:19 AM	33.277721	-117.568268	10:29 AM	33.283456	-117.557865
40	10/30/2017	10:29 AM	33.281633	-117.557026	10:43 AM	33.269287	-117.570981
40T	10/30/2017	10:44 AM	33.268953	-117.572393	10:50 AM	33.273859	-117.579838
41	10/30/2017	10:51 AM	33.274726	-117.579571	11:05 AM	33.287493	-117.565202
41T	10/30/2017	11:06 AM	33.288948	-117.564024	11:13 AM	33.295512	-117.570077
42	10/30/2017	11:14 AM	33.294946	-117.571669	11:51 AM	33.261262	-117.609565
42T	10/30/2017	11:52 AM	33.261225	-117.611083	12:00 PM	33.270624	-117.613606
43	10/30/2017	12:00 PM	33.270641	-117.613588	12:32 PM	33.300475	-117.580227
44	10/30/2017	12:24 PM	33.301952	-117.580392	12:38 PM	33.306113	-117.585375
45	10/30/2017	1:10 PM	33.277618	-117.619615	1:30 PM	33.297145	-117.636127
46	10/30/2017	1:30 PM	33.297571	-117.636300	2:02 PM	33.328484	-117.607561
47	10/30/2017	2:15 PM	33.315773	-117.598700	2:37 PM	33.295667	-117.621346

## **Appendix A: Weather Observation Forms**

### Marine Environmental Variables Form

Dates: 10/25/2017 – 10/31/2017

Date	Time	Latitude	Longitude	Vessel Activity	Weather	Cloud Cover	Glare	Visibility	Wind Speed	Sea State	Swell Height	Monitors
10/25	7:40 am	33.21°	-117.426°	Survey	Sunny	Clear	Medium	5+ nm	10 kts	Large wavelets	2-3 ft	S. Hartwell, J. Conrad, J. Currie
10/26	8:15 am	33.20	-117.43	Survey	Sunny	Clear	Medium	5+ nm	5-7 kts	Small wavelets	2 ft	J. Conrad, J. Currie
10/27	7:15 am	33.23	-117.38	Survey	Sunny	Clear	Medium	5+ nm	<5 kts	Glassy	1 ft	J. Conrad, J. Currie
10/28	7:30 am	33.26	-117.39	Survey	Fog	Overcast	None	1-2 nm	5 kts	Small wavelets	2 ft	J. Conrad, J. Currie
10/29	7:15 am	33.19	-117.41	Survey	Fog	Overcast	None	2-3 nm	<5 kts	Small wavelets	1-2 ft	J. Conrad, J. White, R. Sliter
10/30	8:30 am	33.12	-117.27	Survey	Fog	Overcast	None	2-3 nm	7-10 kts	Large wavelets	2-3 ft	J. Conrad, J. White, R. Sliter

## **Appendix B: Marine Wildlife Observations**

### Marine Wildlife Observations Form

Date: 10/25/2017

Monitor: S. Hartwell, J. Conrad, J. Currie

Time: 5:35 pm	Latitude: 33° 16.38048'	Longitude: -117° 33.76810'
Weather: Sunny	Cloud Cover: Clear	Glare: Medium
Visibility: 5+ nm	Wind Speed: 10 kts	Sea State: large wavelets
Swell Height: 2-3 feet	Survey Vessel Activity: Survey	
Marine Wildlife Observations and Interactions:		
California Sea Lion, 50 m, ship in transit (equipment off)		

Time: 5:47 pm	Latitude: 33° 13.77676'	Longitude: -117° 29.30253'
Weather: Sunny	Cloud Cover: Clear	Glare: Medium
Visibility: 5+ nm	Wind Speed: 10 kts	Sea State: large wavelets
Swell Height: 2-3 feet	Survey Vessel Activity: Survey	
Marine Wildlife Observations and Interactions:		
California Sea Lion, 100 m, ship in transit (equipment off)		

Date: 10/26/2017

Monitor: J. Conrad, J. Currie

Time: 10:51 am	Latitude: 33° 18.08781'	Longitude: -117° 33.64842'
Weather: Sunny	Cloud Cover: Clear	Glare: Medium
Visibility: 5+ nm	Wind Speed: 5-7 kts	Sea State: small wavelets
Swell Height: 2 feet	Survey Vessel Activity: Survey	
Marine Wildlife Observations and Interactions:		
Approx. 12 Common Dolphins, transiting across ship course, 20 m, shutdown.		

Time: 10:53 am	Latitude: 33° 18.21797'	Longitude: -117° 33.81728'
Weather: Sunny	Cloud Cover: Clear	Glare: Medium
Visibility: 5+ nm	Wind Speed: 5-7 kts	Sea State: small wavelets
Swell Height: 2 feet	Survey Vessel Activity: Survey	
Marine Wildlife Observations and Interactions:		
Four Common Dolphins, transiting across ship course, 3 m, shutdown.		



Time: 11:07 am	Latitude: 33° 18.86443'	Longitude: -117° 34.63252'
Weather: Sunny	Cloud Cover: Clear	Glare: Medium
Visibility: 5+ nm	Wind Speed: 5-7 kts	Sea State: small wavelets
Swell Height: 2 feet	Survey Vessel Activity: Survey	
Marine Wildlife Observations and Interactions:		
Approx. 6 Common Dolphins, transiting across ship course, 20 m, shutdown.		

Time: 1:51 pm	Latitude: 33° 17.29248'	Longitude: -117° 34.31449'
Weather: Sunny	Cloud Cover: Clear	Glare: Medium
Visibility: 5+ nm	Wind Speed: 5-7 kts	Sea State: small wavelets
Swell Height: 2 feet	Survey Vessel Activity: Survey	
Marine Wildlife Observations and Interactions:		
California Sea Lion, 150 m, sitting with kelp.		

Date: 10/27/2017

Monitor: J. Conrad, J. Currie

Time: 8:22 am	Latitude: 33° 13.22639'	Longitude: -117° 28.49415'
Weather: Sunny	Cloud Cover: Clear	Glare: Medium
Visibility: 5+ nm	Wind Speed: <5 kts	Sea State: glassy
Swell Height: 1 foot	Survey Vessel Activity: Survey	
Marine Wildlife Observations and Interactions:		
Approx. 12 Common Dolphins, 30 m, passed by ship without stopping.		

Time: 8:27 am	Latitude: 33° 13.51369'	Longitude: -117° 28.84610'
Weather: Sunny	Cloud Cover: Clear	Glare: Medium
Visibility: 5+ nm	Wind Speed: <5 kts	Sea State: glassy
Swell Height: 1 foot	Survey Vessel Activity: Survey	
Marine Wildlife Observations and Interactions:		
Approx. 12 Common Dolphins, 50 m, passed by ship without stopping.		

Time: 4:15 pm	Latitude: 33° 15.19954'	Longitude: -117° 29.14283'
Weather: Sunny	Cloud Cover: Clear	Glare: Medium
Visibility: 5+ nm	Wind Speed: <5 kts	Sea State: glassy
Swell Height: 1 foot	Survey Vessel Activity: Survey	
Marine Wildlife Observations and Interactions:		
California Sea Lion, 150 m, floating, waving flipper.		

Date: 10/28/2017

Monitor: J. Conrad, J. Currie

Time: 10:07 am	Latitude: 33° 18.84213'	Longitude: -117° 35.98810'
Weather: Fog	Cloud Cover: Overcast	Glare: None
Visibility: 1-2 nm	Wind Speed: 5 kts	Sea State: small wavelets
Swell Height: 2 foot	Survey Vessel Activity: Survey	
Marine Wildlife Observations and Interactions:		
Four Common Dolphins, 5 m, approached ship and departed.		

Time: 2:35 pm	Latitude: 33° 16.12050'	Longitude: -117° 29.46956'
Weather: Fog	Cloud Cover: Overcast	Glare: None
Visibility: 1-2 nm	Wind Speed: 5 kts	Sea State: small wavelets
Swell Height: 2 foot	Survey Vessel Activity: Survey	
Marine Wildlife Observations and Interactions:		
8 Common Dolphins, 20 m, approached ship and departed.		

Date: 10/29/2017

Monitor: J. Conrad, J. White, R. Sliter

Time: 9:31 am	Latitude: 33° 17.92506'	Longitude: -117° 32.05163'
Weather: Fog	Cloud Cover: Overcast	Glare: None
Visibility: 2-3 nm	Wind Speed: <5 kts	Sea State: small wavelets
Swell Height: 2 feet	Survey Vessel Activity: Survey	
Marine Wildlife Observations and Interactions:		
California Sea Lion, 200 m, transiting.		

Time: 10:56 am	Latitude: 33° 21.65085'	Longitude: -117° 35.81657'
Weather: Fog	Cloud Cover: Overcast	Glare: None
Visibility: 2-3 nm	Wind Speed: <5 kts	Sea State: small wavelets
Swell Height: 2 feet	Survey Vessel Activity: Survey	
Marine Wildlife Observations and Interactions:		
California Sea Lion, 30 m, ship passed by floating animal.		

Date: 10/30/2017

Monitor: J. Conrad, J. White, R. Sliter

Time: 8:28 am	Latitude: 33° 12.14063'	Longitude: -117° 27.49195'
Weather: Fog	Cloud Cover: Overcast	Glare: None
Visibility: 2-3 nm	Wind Speed: 7-10 kts	Sea State: large wavelets
Swell Height: 2-3 foot	Survey Vessel Activity: Survey	
Marine Wildlife Observations and Interactions:		
California Sea Lion, 10 m, checking out ship during deployment (equipment not operating).		

Time: 9:03 am	Latitude: 33° 13.11352'	Longitude: -117° 29.26491'
Weather: Fog	Cloud Cover: Overcast	Glare: None
Visibility: 2-3 nm	Wind Speed: 7-10 kts	Sea State: large wavelets
Swell Height: 2-3 foot	Survey Vessel Activity: Survey	
Marine Wildlife Observations and Interactions:		
California Sea Lion, 150 m, floating, possibly a buoy.		

## EXHIBIT H

## Mitigation Monitoring Program

Mitigation Measure (MM)	Location and Scope of Mitigation	Effectiveness Criteria	Monitoring or Reporting Action	Responsible Party	Timing	Implementation Date(s) and Initials
<b>Air Quality and Greenhouse Gas (GHG) Emissions (MND Section 3.3.3)</b>						
<b>MM AIR-1: Engine Tuning, Engine Certification, and Fuels.</b> The following measures will be required to be implemented by all Permittees under the Offshore Geophysical Permit Program (OGPP), as applicable depending on the county offshore which a survey is being conducted. Pursuant to section 93118.5 of CARB's Airborne Toxic Control Measures, the Tier 2 engine requirement applies only to diesel-fueled vessels.	<b>All Counties:</b> Maintain all construction equipment in proper tune according to manufacturers' specifications; fuel all off-road and portable diesel-powered equipment with California Air Resources Board (CARB)-certified motor vehicle diesel fuel limiting sulfur content to 15 parts per million or less (CARB Diesel).	Daily emissions of criteria pollutants during survey activities are minimized.	Determine engine certification of vessel engines.	OGPP permit holder and contract vessel operator; California State Lands Commission (CSLC) review of Final Monitoring Report.	Prior to, during, and after survey activities.  Submit Final Monitoring Report after completion of survey activities.	10/4/17 TY
	<b>Los Angeles and Orange Counties:</b> Use vessel engines meeting CARB's Tier 2-certified engines or cleaner; the survey shall be operated such that daily NO <sub>x</sub> emissions do not exceed 100 pounds based on engine certification emission factors. This can be accomplished with Tier 2 engines if daily fuel use is 585 gallons or less, and with Tier 3 engines if daily fuel use is 935 gallons or less.		Review engine emissions data to assess compliance, determine if changes in tuning or fuel are required.			
	<b>San Luis Obispo County:</b> Use vessel engines meeting CARB's Tier 2-certified engines or cleaner, accomplished with Tier 2 engines if daily fuel use is 585 gallons or less; all diesel equipment shall not idle for more than 5 minutes; engine use needed to maintain position in the water is not considered idling; diesel idling within 300 meters (1,000 feet) of sensitive receptors is not permitted; use alternatively fueled construction equipment on site where feasible, such as compressed natural gas, liquefied natural gas, propane or biodiesel.		Verify that Tier 2 or cleaner engines are being used.			
	<b>Santa Barbara County:</b> Use vessel engines meeting CARB's Tier 2-certified engines or cleaner, accomplished with Tier 2 engines if daily fuel use is 790 gallons or less.		Calculate daily NO <sub>x</sub> emissions to verify compliance with limitations.			
	<b>Ventura County:</b> Use alternatively fueled construction equipment on site where feasible, such as compressed natural gas, liquefied natural gas, propane or biodiesel.		Verify that Tier 2 or cleaner engines are being used.			
			Inform vessel operator(s) of idling limitation.			
			Investigate availability of alternative fuels.			
			Investigate availability of alternative fuels.			
			Investigate availability of alternative fuels.			

## EXHIBIT H

## Mitigation Monitoring Program

Mitigation Measure (MM)	Location and Scope of Mitigation	Effectiveness Criteria	Monitoring or Reporting Action	Responsible Party	Timing	Implementation Date(s) and Initials
<b>MM BIO-1:</b> Marine Mammal and Sea Turtle Presence – Current Information.	All State waters; prior to commencement of survey operations, the geophysical operator shall: (1) contact the National Oceanic and Atmospheric Administration Long Beach office staff and local whale-watching operations and shall acquire information on the current composition and relative abundance of marine wildlife offshore, and (2) convey sightings data to the vessel operator and crew, survey party chief, and onboard Marine Wildlife Monitors (MWMs) prior to departure. This information will aid the MWMs by providing data on the approximate number and types of organisms that may be in the area.	No adverse effects to marine mammals or sea turtles due to survey activities are observed.	Document contact with appropriate sources.  Submit Final Monitoring Report after completion of survey activities.	OGPP permit holder; Inquiry to NOAA and local whale watching operators.	Prior to survey.	10/4/17 TC
<b>MM BIO-2:</b> Marine Wildlife Monitors (MWMs).	Except as provided in section 7(h) of the General Permit, a minimum of two (2) qualified MWMs who are experienced in marine wildlife observations shall be onboard the survey vessel throughout both transit and data collection activities. The specific monitoring, observation, and data collection responsibilities shall be identified in the Marine Wildlife Contingency Plan required as part of all Offshore Geophysical Permit Program permits. Qualifications of proposed MWMs shall be submitted to the National Oceanic and Atmospheric Administration (NOAA) and CSLC at least twenty-one (21) days in advance of the survey for their approval by the agencies. Survey operations shall not commence until the CSLC approves the MWMs.	Competent and professional monitoring or marine mammals and sea turtles; compliance with established monitoring policies.	Document contact with and approval by appropriate agencies.  Submit Final Monitoring Report after completion of survey activities.	OGPP permit holder.	Prior to survey.	10/4/17 TC
<b>MM BIO-3:</b> Safety Zone Monitoring.	Onboard Marine Wildlife Monitors (MWMs) responsible for observations during vessel transit shall be responsible for monitoring during the survey equipment operations. All visual monitoring shall occur from the highest practical vantage point aboard the survey vessel; binoculars shall be used to observe the surrounding area, as appropriate. The MWMs will survey an area (i.e., safety or exclusion zone) based on the equipment used, centered on the sound source (i.e., vessel, towfish), throughout time that the survey equipment is operating. Safety zone radial distances, by equipment type, include:	No adverse effects to marine mammals or sea turtles due to survey activities are observed; compliance with established safety zones.	Compliance with permit requirements (observers); compliance with established safety zones.  Submit Final Monitoring Report after completion of survey activities.	OGPP permit holder.	Prior to survey.	10/4/17 TC

## EXHIBIT H

## Mitigation Monitoring Program

Mitigation Measure (MM)	Location and Scope of Mitigation	Effectiveness Criteria	Monitoring or Reporting Action	Responsible Party	Timing	Implementation Date(s) and Initials												
	<table><tr><th>Equipment Type</th><th>Safety Zone (radius, m)</th></tr><tr><td>Single Beam Echosounder</td><td>50</td></tr><tr><td>Multibeam Echosounder</td><td>500</td></tr><tr><td>Side-Scan Sonar</td><td>600</td></tr><tr><td>Subbottom Profiler</td><td>100</td></tr><tr><td>Boomer System</td><td>100</td></tr></table> <p>If the geophysical survey equipment is operated at or above a frequency of 200 kilohertz (kHz), safety zone monitoring and enforcement is not required; however, if geophysical survey equipment operated at a frequency at or above 200 kHz is used simultaneously with geophysical survey equipment less than 200 kHz, then the safety zone for the equipment less than 200 kHz must be monitored. The onboard MWMs shall have authority to stop operations if a mammal or turtle is observed within the specified safety zone and may be negatively affected by survey activities. The MWMs shall also have authority to recommend continuation (or cessation) of operations during periods of limited visibility (i.e., fog, rain) based on the observed abundance of marine wildlife. Periodic reevaluation of weather conditions and reassessment of the continuation/cessation recommendation shall be completed by the onboard MWMs. During operations, if an animal's actions are observed to be irregular, the monitor shall have authority to recommend that equipment be shut down until the animal moves further away from the sound source. If irregular behavior is observed, the equipment shall be shut-off and will be restarted and ramped-up to full power, as applicable, or will not be started until the animal(s) is/are outside of the safety zone or have not been observed for 15 minutes.</p> <p>For nearshore survey operations utilizing vessels that lack the personnel capacity to hold two (2) MWMs aboard during survey operations, at least twenty-one (21) days prior to the commencement of survey activities, the Permittee may petition the CSLC to conduct survey operations with one (1) MWM aboard. The CSLC will consider such authorization on a case-by-case basis and</p>	Equipment Type	Safety Zone (radius, m)	Single Beam Echosounder	50	Multibeam Echosounder	500	Side-Scan Sonar	600	Subbottom Profiler	100	Boomer System	100					10/4/17
Equipment Type	Safety Zone (radius, m)																	
Single Beam Echosounder	50																	
Multibeam Echosounder	500																	
Side-Scan Sonar	600																	
Subbottom Profiler	100																	
Boomer System	100																	

Updated: 04/23/2014

## EXHIBIT H

## Mitigation Monitoring Program

Mitigation Measure (MM)	Location and Scope of Mitigation	Effectiveness Criteria	Monitoring or Reporting Action	Responsible Party	Timing	Implementation Date(s) and Initials
	factors the CSLC will consider will include the timing, type, and location of the survey, the size of the vessel, and the availability of alternate vessels for conducting the proposed survey. CSLC authorizations under this subsection will be limited to individual surveys and under any such authorization; the Permittee shall update the MWCP to reflect how survey operations will occur under the authorization.					
MM BIO-4: Limits on Nighttime OGPP Surveys.	All State waters; nighttime survey operations are prohibited under the OGPP, except as provided below. The CSLC will consider the use of single beam echosounders and passive equipment types at night on a case-by-case basis, taking into consideration the equipment specifications, location, timing, and duration of survey activity.	No adverse effects to marine mammals or sea turtles due to survey activities are observed.	Presurvey request for nighttime operations, including equipment specifications and proposed use schedule.  Document equipment use.  Submit Final Monitoring Report after completion of survey activities.	OGPP permit holder.	Approval required before survey is initiated.  Monitoring Report following completion of survey.	10/4/17 TC
MM BIO-5: Soft Start.	All State waters; the survey operator shall use a "soft start" technique at the beginning of survey activities each day (or following a shut down) to allow any marine mammal that may be in the immediate area to leave before the sound sources reach full energy. Surveys shall not commence at nighttime or when the safety zone cannot be effectively monitored. Operators shall initiate each piece of equipment at the lowest practical sound level, increasing output in such a manner as to increase in steps not exceeding approximately 6 decibels (dB) per 5-minute period. During ramp-up, the Marine Wildlife Monitors (MWMs) shall monitor the safety zone. If marine mammals are sighted within or about to enter the safety zone, a power-down or shut down shall be implemented as though the equipment was operating at full power. Initiation of ramp-up procedures from shut down requires that the MWMs be able to visually observe the full safety zone.	No adverse effects to marine mammals or sea turtles due to survey activities are observed.	Compliance with permit requirements (observers); compliance with safe start procedures.  Submit Final Monitoring Report after completion of survey activities.	OGPP permit holder.	Immediately prior to survey.	10/25/17 TC

## EXHIBIT H

## Mitigation Monitoring Program

Mitigation Measure (MM)	Location and Scope of Mitigation	Effectiveness Criteria	Monitoring or Reporting Action	Responsible Party	Timing	Implementation Date(s) and Initials
<b>MM BIO-6:</b> Practical Limitations on Equipment Use and Adherence to Equipment Manufacturer's Routine Maintenance Schedule.	<p>All State waters; geophysical operators shall follow, to the maximum extent possible, the guidelines of Zykov (2013) as they pertain to the use of subbottom profilers and side-scan sonar, including:</p> <ul style="list-style-type: none"> <li>Using the highest frequency band possible for the subbottom profiler;</li> <li>Using the shortest possible pulse length; and</li> <li>Lowering the pulse rate (pings per second) as much as feasible.</li> </ul> <p>Geophysical operators shall consider the potential applicability of these measures to other equipment types (e.g., boomer). Permit holders will conduct routine inspection and maintenance of acoustic-generating equipment to ensure that low energy geophysical equipment used during permitted survey activities remains in proper working order and within manufacturer's equipment specifications. Verification of the date and occurrence of such equipment inspection and maintenance shall be provided in the required presurvey notification to CSLC.</p>	No adverse effects to marine mammals or sea turtles due to survey activities are observed.	<p>Document initial and during survey equipment settings.</p> <p>Submit Final Monitoring Report after completion of survey activities.</p>	OGPP permit holder.	Immediately prior to and during survey.	10/25/17 TZ
<b>MM BIO-7:</b> Avoidance of Pinniped Haul-Out Sites.	<p>The Marine Wildlife Contingency Plan (MWCP) developed and implemented for each survey shall include identification of haul-out sites within or immediately adjacent to the proposed survey area. For surveys within 300 meters (m) of a haul-out site, the MWCP shall further require that:</p> <ul style="list-style-type: none"> <li>The survey vessel shall not approach within 91 m of a haul-out site, consistent with National Marine Fisheries Service (NMFS) guidelines;</li> <li>Survey activity close to haul-out sites shall be conducted in an expedited manner to minimize the potential for disturbance of pinnipeds on land; and</li> <li>Marine Wildlife Monitors shall monitor pinniped activity onshore as the vessel approaches, observing and reporting on the number of pinnipeds potentially disturbed (e.g., via head lifting, flushing into the water). The purpose of such reporting is to provide CSLC and California Department of Fish and Wildlife (CDFW) with information regarding potential disturbance associated with OGPP surveys.</li> </ul>	No adverse effects to pinnipeds at haul outs are observed.	<p>Document pinniped reactions to vessel presence and equipment use.</p> <p>Submit Final Monitoring Report after completion of survey activities.</p>	OGPP permit holder.	Monitoring Report following completion of survey.	11/2/17 TZ



## EXHIBIT H

## Mitigation Monitoring Program

Mitigation Measure (MM)	Location and Scope of Mitigation	Effectiveness Criteria	Monitoring or Reporting Action	Responsible Party	Timing	Implementation Date(s) and Initials
MM BIO-8: Reporting Requirements – Collision.	<p>All State waters; if a collision with marine mammal or reptile occurs, the vessel operator shall document the conditions under which the accident occurred, including the following:</p> <ul style="list-style-type: none"> <li>Vessel location (latitude, longitude) when the collision occurred;</li> <li>Date and time of collision;</li> <li>Speed and heading of the vessel at the time of collision;</li> <li>Observation conditions (e.g., wind speed and direction, swell height, visibility in miles or kilometers, and presence of rain or fog) at the time of collision;</li> <li>Species of marine wildlife contacted (if known);</li> <li>Whether an observer was monitoring marine wildlife at the time of collision; and,</li> <li>Name of vessel, vessel owner/operator, and captain officer in charge of the vessel at time of collision.</li> </ul> <p>After a collision, the vessel shall stop, if safe to do so; however, the vessel is not obligated to stand by and may proceed after confirming that it will not further damage the animal by doing so. The vessel will then immediately communicate by radio or telephone all details to the vessel's base of operations, and shall immediately report the incident. Consistent with Marine Mammal Protection Act requirements, the vessel's base of operations or, if an onboard telephone is available, the vessel captain him/herself, will then immediately call the National Oceanic and Atmospheric Administration (NOAA) Stranding Coordinator to report the collision and follow any subsequent instructions. From the report, the Stranding Coordinator will coordinate subsequent action, including enlisting the aid of marine mammal rescue organizations, if appropriate. From the vessel's base of operations, a telephone call will be placed to the Stranding Coordinator, NOAA National Marine Fisheries Service (NMFS), Southwest Region, Long Beach, to obtain instructions. Although NOAA has primary responsibility for marine mammals in both State and Federal waters, the California Department of Fish and Wildlife (CDFW) will also be advised that an incident has occurred in State waters affecting a protected species.</p>	No adverse effects to marine mammals or sea turtles due to survey activities are observed.	Submit Final Monitoring Report after completion of survey activities.	OGPP permit holder.	Monitoring Report following completion of survey.	11/2/17 TC

Updated: 04/23/2014

**EXHIBIT H**

*Mitigation Monitoring Program*

<b>Mitigation Measure (MM)</b>	<b>Location and Scope of Mitigation</b>	<b>Effectiveness Criteria</b>	<b>Monitoring or Reporting Action</b>	<b>Responsible Party</b>	<b>Timing</b>	<b>Implementation Date(s) and Initials</b>
<b>MM BIO-9:</b> Limitations on Survey Operations in Select Marine Protected Areas (MPAs).	All MPAs; prior to commencing survey activities, geophysical operators shall coordinate with the CLSC, California Department of Fish and Wildlife (CDFW), and any other appropriate permitting agency regarding proposed operations within MPAs. The scope and purpose of each survey proposed within a MPA shall be defined by the permit holder, and the applicability of the survey to the allowable MPA activities shall be delineated by the permit holder. If deemed necessary by CDFW, geophysical operators will pursue a scientific collecting permit, or other appropriate authorization, to secure approval to work within a MPA, and shall provide a copy of such authorization to the CSLC as part of the required presurvey notification to CSLC. CSLC, CDFW, and/or other permitting agencies may impose further restrictions on survey activities as conditions of approval.	No adverse effects to MPA resources due to survey activities are observed.	Monitor reactions of wildlife to survey operations; report on shutdown conditions and survey restart.  Submit Final Monitoring Report after completion of survey activities.	OGPP permit holder; survey permitted by CDFW.	Prior to survey.	10/4/17 TE
<b>MM HAZ-1:</b> Oil Spill Contingency Plan (OSCP) Required Information.	Permittees shall develop and submit to CSLC staff for review and approval an OSCP that addresses accidental releases of petroleum and/or non-petroleum products during survey operations. Permittees' OSCP's shall include the following information for each vessel to be involved with the survey: <ul style="list-style-type: none"> <li>• Specific steps to be taken in the event of a spill, including notification names, phone numbers, and locations of: (1) nearby emergency medical facilities, and (2) wildlife rescue/response organizations (e.g., Oiled Wildlife Care Network);</li> <li>• Description of crew training and equipment testing procedures; and</li> <li>• Description, quantities, and location of spill response equipment onboard the vessel.</li> </ul>	Reduction in the potential for an accidental spill. Proper and timely response and notification of responsible parties in the event of a spill.	Documentation of proper spill training.  Notification of responsible parties in the event of a spill.	OGPP permit holder and contract vessel operator.	Prior to survey.	10/4/17 TE
<b>MM HAZ-2:</b> Vessel fueling restrictions.	Vessel fueling shall only occur at an approved docking facility. No cross vessel fueling shall be allowed.	Reduction in the potential for an accidental spill.	Documentation of fueling activities.	Contract vessel operator.	Following survey.	11/2/17 TE
<b>MM HAZ-3:</b> OSCP equipment and supplies.	Onboard spill response equipment and supplies shall be sufficient to contain and recover the worst-case scenario spill of petroleum products as outlined in the OSCP.	Proper and timely response in the event of a spill.	Notification to CSLC of onboard spill response equipment/supplies inventory, verify	Contract vessel operator.	Prior to survey.	10/4/18 TE

Updated: 04/23/2014

## EXHIBIT H

*Mitigation Monitoring Program*

Mitigation Measure (MM)	Location and Scope of Mitigation	Effectiveness Criteria	Monitoring or Reporting Action	Responsible Party	Timing	Implementation Date(s) and Initials
			ability to respond to worst-case spill.			
<b>MM HAZ-1:</b> Oil Spill Contingency Plan (OSCP) Required Information.	Outlined under Hazards and Hazardous Materials (above)					
<b>MM HAZ-2:</b> Vessel fueling restrictions.	Outlined under Hazards and Hazardous Materials (above)					
<b>MM HAZ-3:</b> OSCP equipment and supplies.	Outlined under Hazards and Hazardous Materials (above)					
<b>MM BIO-9:</b> Limitations on Survey Operations in Select MPAs.	Outlined under Biological Resources (above)					
<b>MM REC-1:</b> U.S. Coast Guard (USCG), Harbormaster, and Dive Shop Operator Notification.	All California waters where recreational diving may occur; as a survey permit condition, the CSLC shall require Permittees to provide the USCG with survey details, including information on vessel types, survey locations, times, contact information, and other details of activities that may pose a hazard to divers so that USCG can include the information in the Local Notice to Mariners, advising vessels to avoid potential hazards near survey areas. Furthermore, at least twenty-one (21) days in advance of in-water activities, Permittees shall: (1) post such notices in the harbormasters' offices of regional harbors; and (2) notify operators of dive shops in coastal locations adjacent to the proposed offshore survey operations.	No adverse effects to recreational divers from survey operations.	Notify the USCG, local harbormasters, and local dive shops of planned survey activity.  Submit Final Monitoring Report after completion of survey activities.	OGPP permit holder.	Prior to survey.	10/4/17 TE

Updated: 04/23/2014

# EXHIBIT H

## Mitigation Monitoring Program

Mitigation Measure (MM)	Location and Scope of Mitigation	Effectiveness Criteria	Monitoring or Reporting Action	Responsible Party	Timing	Implementation Date(s) and Initials
<b>MM FISH-1:</b> U.S. Coast Guard (USCG) and Harbormaster Notification.	All California waters; as a survey permit condition, the CSLC shall require Permittees to provide the USCG with survey details, including information on vessel types, survey locations, times, contact information, and other details of activities that may pose a hazard to mariners and fishers so that USCG can include the information in the Local Notice to Mariners, advising vessels to avoid potential hazards near survey areas. Furthermore, at least twenty-one (21) days in advance of in-water activities, Permittees shall post such notices in the harbormasters' offices of regional harbors.	No adverse effects to commercial fishing gear in place.	Notify the USCG and local harbormasters of planned survey activity.  Submit Final Monitoring Report after completion of survey activities.	OGPP permit holder.	Prior to survey.	10/4/17 TE
<b>MM FISH-2:</b> Minimize Interaction with Fishing Gear.	To minimize interaction with fishing gear that may be present within a survey area: (1) the geophysical vessel (or designated vessel) shall traverse the proposed survey corridor prior to commencing survey operations to note and record the presence, type, and location of deployed fishing gear (i.e., buoys); (2) no survey lines within 30 m (100 feet) of observed fishing gear shall be conducted. The survey crew shall not remove or relocate any fishing gear; removal or relocation shall only be accomplished by the owner of the gear upon notification by the survey operator of the potential conflict.	No adverse effects to commercial fishing gear in place.	Visually observe the survey area for commercial fishing gear. Notify the gear owner and request relocation of gear outside survey area.  Submit Final Monitoring Report after completion of survey activities.	OGPP permit holder.	Immediately prior to survey (prior to each survey day).	10/25/17 TE
<b>MM FISH-1:</b> USCG and Harbormaster Notification.	Outlined under <b>Commercial and Recreational Fisheries</b> (above)					10/4/17 TE

Acronyms/Abbreviations: CARB = California Air Resources Board; CDFW = California Department of Fish and Wildlife; CSLC = California State Lands Commission; dB = decibels; kHz = kilohertz; MPA = Marine Protected Area; MWCP = Marine Wildlife Contingency Plan; MWM = Marine Wildlife Monitor; m= meter(s); NOAA = National Oceanic and Atmospheric Administration; NO<sub>x</sub> = Nitrogen Oxide; OGPP = Offshore Geophysical Permit Program; OSCP = Oil Spill Contingency Plan; USCG = U.S. Coast Guard

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